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Prepared for: U.S. DOT Pipeline and Hazardous Materials Safety Administration

Project Title: Define Optimize, and Validate Detection and Sizing Capabilities of Phased-Array Ultrasonic Technique to Inspect Joints in Polyethylene Pipes

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Progress to date: EWI conducted an initial evaluation of the ultrasonic (UT) phased array (PA) technique for inspection of electrofusion (EF) joints through a project funded by NYSEARCH, the research arm of Northeast Gas Association (NGA). Real-time PA ultrasonic imaging was successfully applied for nondestructive evaluation (NDE) of EF lap joints and other joints in polyethylene (PE) pipes. PA demonstrated the ability to allow identification of heating wire location, detection of imperfect or incomplete fusion, and may allow sizing of joint flaws such as contamination air and inclusions. Good agreement between PA UT and Destructive Testing (DT) results was achieved for detection of these flaws. Detection of implanted/seeded light dirt using PA UT was not reliable. PA UT was not able to detect some degree of oil contamination, angular misalignment and lack of fusion caused by improper cleaning of the pipe surface for a limited number of pipe samples. Therefore, a continuation of further open validation trials and comprehensive blind testing of portable/handheld PA instrumentation and probes to determine their capabilities to reliably inspect EF, butt-fusion (BF), and saddle-fusion (SF) joints in laboratory and field conditions were recommended. This project is a follow on effort to define, optimize, and validate detection and sizing capabilities of PA UT to inspect joints in PE pipes and funded by the U.S. DOT PHMSA and NYSEARCH with an expanded project team. EWI is leading the effort in collaboration with NYSEARCH, GE Inspection Technologies, Harfang, JANX, M2M, Mechanical Integrity, NiSource Pipeline Group, SoCal, Olympus NDT, and Technology Design.

Detection limits and defect-sizing accuracy have been completed for PA UT for inspection of EF, BF and SF joint types in PE gas distribution pipelines with a combination of experimental testing/verification in conjunction with comprehensive UT modeling and simulation tools. The draft final report, reference library materials and probability of detection curves have been submitted to DOT for review. One field trial is complete; two more will be scheduled before September 30, 2008.